WHAT IS CLAIMED IS:

1. A method for diagnosing breast cancer in humans that comprises the steps of:

a. Bringing a diagnostic probe in touch with breast tissue, said diagnostic probe further comprises an ultrasound imaging elements and photo-acoustic illumination and detection elements,

b. Illuminating said breast tissue with short duration light pulses having wavelengths that lie in the absorption spectral bands of hemoglobin, to generate photoacoustic signals,

c. detecting said photoacoustic signal using ultrasound transducers to determine the distribution of blood (vascularization) of breast tissue,

d. generating and detecting an ultrasound image of the morphology of said human breast tissue, using ultrasound transducers that are co-registered with said photo-acoustic detection transducers used in the detection of said photo acoustic signals; and

e. Overlaying said photo acoustic vascularization image over said ultrasound morphology image to generate a combined image of the vascular distribution in different morphological structures in the breast, said morphological structure are the lesions of interest.

2. The method of claim 1, wherein the wavelengths of light are in the spectral range between 530 nm and 1300 nm.

3. The method of claim 1, wherein the photo acoustic detection elements and the ultrasound detection elements are common.

4. The method of claim 1, wherein the ultrasound transducers are piezoelectric elements.

5. The method pf claim 1, wherein the ultrasound transducers are PZNT elements.

6. The method pf claim 1, wherein the ultrasound transducers are PVDF elements.

7. The method of claim 1, wherein, the combined photoacoustic detection elements and the ultrasound detection elements are impedance matched to the skin to minimize ultrasound reflection loss.

8. The method of claim 1, wherein coupling gel is applied to the detector elements.

9. An apparatus for diagnosing disease such as breast cancer in humans by superimposing a distribution of the concentration of an analyte, such as hemoglobin over imaged morphological features such as lesions, said apparatus comprising:

a. Light generating unit, which generates light containing a specific wavelength component;

b. An irradiation unit, which radiates the light generated by the light-generating unit into a subject to be examined;

c. Wave guide means for guiding the light generated by the light-generating unit to the

irradiation unit;

d. First electroacoustic conversion means for converting acoustic waves generated in the subject by the light radiated by the irradiation unit into electrical signals by using a plurality of arrayed electroacoustic transducer elements;

e. First image data generating means for generating first image data on the basis of the signals obtained by the first electroacoustic conversion means;

f. Ultrasonic wave transmission means for transmitting ultrasonic waves into the subject;

g. Second electroacoustic conversion means for converting components of the ultrasonic waves transmitted by the ultrasonic wave transmission means which are reflected inside the subject into electrical signals by using a plurality of arrayed electroacoustic transducer elements;

h. Second image data generating means for generating second image data on the basis of the signals obtained by the second electroacoustic conversion means; and

i. Display means for displaying the first image data and the second image data.

10. A subject-information imaging apparatus for the determination distribution of the concentration of an analyte, over imaged morphological features in tissue, said apparatus comprising:

a light generating unit which generates light containing a specific wavelength component;

an irradiation unit which radiates the light generated by the light generating unit into a subject to be examined;

waveguide means for guiding the light generated by the light generating unit to the irradiation unit;

first electroacoustic conversion means for converting acoustic waves generated in the subject by the light radiated by the irradiation unit into electrical signals by using a plurality of arrayed electroacoustic transducer elements;

first image data generating means for generating first image data on the basis of the signals obtained by the first electroacoustic conversion means;

ultrasonic wave transmission means for transmitting ultrasonic waves into the subject;

second electroacoustic conversion means for converting components of the ultrasonic waves transmitted by the ultrasonic wave transmission means which are reflected inside the subject into electrical signals by using a plurality of arrayed electroacoustic transducer elements;

second image data generating means for generating second image data on the basis of the signals obtained by the second electroacoustic conversion means; and

display means for displaying the first image data

and the second image data.

11. An apparatus according to claim 10, wherein at least one of said plurality of electroacoustic transducer elements of the first electroacoustic conversion means is commonly used as one of said plurality of electroacoustic transducer elements of the second electroacoustic conversion means.

12. An apparatus according to claim 10, wherein the waveguide means is constituted by a plurality of optical fibers, and end portions of the optical fibers on one side are arrayed and open at the irradiation unit.

13. An apparatus according to claim 12, wherein said plurality of electroacoustic transducer elements of the first and second electroacoustic conversion means are arrayed in substantially the same direction as an array direction of said plurality of optical fiber opening portions.

14. An apparatus according to claim 13, wherein said plurality of optical fiber opening portions and said plurality of electroacoustic transducer elements are arrayed one-dimensionally.

15. An apparatus according to claim 13, wherein said plurality of optical fiber opening portions and said plurality of electroacoustic transducer elements are arrayed two-dimensionally in substantially the same plane.

16. An apparatus according to claim 13, wherein said plurality of optical fiber opening portions are arranged in gaps formed when the electroacoustic transducer elements are arrayed.

17. An apparatus according to claim 10, wherein the first electroacoustic conversion means converts the acoustic waves into electrical signals by selecting and using a plurality of adjacent electroacoustic transducer elements of said plurality of electro-acoustic transducer elements.

18. An apparatus according to claim 17, wherein the first image data generating means performs phased addition of a plurality of electrical signals obtained by the electroacoustic transducer elements selected by the first electroacoustic conversion means.

19. An apparatus according to claim 12, further comprising optical scanning means for selecting a predetermined optical fiber from said plurality of optical fibers and supplying light to the irradiation unit.

20. An apparatus according to claim 19, wherein a middle position between a plurality of electro-acoustic transducer elements selected by the first electroacoustic conversion means substantially coincides with an opening position of an optical fiber selected by the optical scanning means at the irradiation unit.

21. An apparatus according to claim 10, wherein the electroacoustic transducer elements of the first and second electroacoustic conversion means are formed from a piezoelectric single crystal.

22. An apparatus according to claim 10 or 21, wherein the electroacoustic transducer elements are arranged between the irradiation unit and the subject, and light output from the irradiation unit is transmitted through the electroacoustic transducer elements and radiated on the subject.

23. An apparatus according to claim 13 or 22, wherein an array density of said plurality of optical fiber opening portions in the irradiation unit is higher than an array density of said plurality of electroacoustic transducer elements.

24. An apparatus according to claim 22, further comprising an optical lens between the irradiation unit and said plurality of arrayed electroacoustic transducer elements, the optical lens setting a spot size of light output from the irradiation unit to a predetermined width in the array direction of the electroacoustic transducer elements.

25. An apparatus according to claim 24, further comprising a slit plate between the optical lens and the electroacoustic conversion element, the slit plate setting a beam width of light output from the optical lens in a slice direction perpendicular to the array

direction of the electroacoustic transducer elements.

26. An apparatus according to claim 10, wherein the second image data generating means generates image data by extracting harmonic components from reception signals acquired by the second electroacoustic conversion means.

27. An apparatus according to claim 10, wherein irradiation of light from the irradiation unit for generation of the first image data and transmission of ultrasonic waves from the ultrasonic wave transmission means for generation of the second image data are alternately performed.

28. An apparatus according to claim 27, wherein irradiation of light from the irradiation unit and transmission of ultrasonic waves from the ultrasonic wave transmission means are alternately performed in each of a plurality of directions.

29. An apparatus according to claim 10, wherein after the first image data corresponding to one frame is generated by making the irradiation unit sequentially radiate light in a plurality of directions, the ultrasonic wave transmission means generates the second image data corresponding to one frame by sequentially transmitting ultrasonic waves in the plurality of directions.

30. An apparatus according to claim 10, wherein irradiation of light from the irradiation unit for

generation of the first image data and transmission of ultrasonic waves from the ultrasonic wave transmission means for generation of the second image data are performed substantially simultaneously.

31. An apparatus according to claim 10, wherein the display means displays the first and second image data on the same monitor.

32. An apparatus according to claim 10 or 31, wherein the display means superimposes/displays the first and second image data.

33. An apparatus according to claim 10 or 32, wherein the display means displays the first and second image data in different colors.

34. An apparatus according to claim 10, wherein the irradiation unit generates light substantially at the same time when the ultrasonic transmission means generates ultrasonic waves.

35. An apparatus according to claim 10, wherein the first electroacoustic conversion means, the ultrasonic wave transmission means, and the second electroacoustic conversion means are commonly formed as piezoelectric vibrators, said plurality of piezoelectric vibrators are arranged at predetermined intervals in the form of a matrix, and optical paths are formed in gaps between the piezoelectric vibrators.

36. An apparatus according to claim 10, wherein the first electroacoustic conversion means, the

ultrasonic wave transmission means, and the second electroacoustic conversion means are commonly formed as piezoelectric vibrators, and said plurality of piezoelectric vibrators are arranged in a line on each of two sides of a multi-type fiber tape.

37. An apparatus according to claim 10, wherein the first electroacoustic conversion means, the ultrasonic wave transmission means, and the second electroacoustic conversion means are commonly formed as piezoelectric vibrators, the pair of piezoelectric vibrators are bonded to a flexible printed board, together with an optical fiber, to form a vibrator plate, and said plurality of vibrator plates are stacked on each other and integrally boded to each other with an adhesive.

38. A subject-information imaging apparatus for the determination distribution of the concentration of a substance, over imaged morphological features in tissue, said apparatus comprising:

irradiation means for irradiating a subject to be examined with light;

ultrasonic wave transmission means for transmitting an ultrasonic wave to the subject;

electroacoustic conversion means for receiving an acoustic wave generated in the subject by the irradiation light or the transmission ultrasonic wave and converting the wave into an electrical signal;

first image data generating means for receiving an electrical signal output from the electroacoustic conversion means and generating first image data on the basis of an acoustic wave originating from the irradiation light;

second image data generating means for receiving an electrical signal output from the electroacoustic conversion means and generating second image data on the basis of an acoustic wave originating from the transmission ultrasonic wave; and

display means for displaying the first and second image data.

39. An apparatus according to claim 38, wherein the ultrasonic wave transmission means is partly commonly used as the electroacoustic conversion means.

40. An apparatus according to claim 38, wherein the display means displays the first and second image data on a single monitor.

41. A subject-information imaging apparatus which irradiates a subject to be examined with light and an ultrasonic wave, receives acoustic waves generated in the subject by the light and ultrasonic wave, converts the waves into electrical signals, generates a plurality of image data on the basis of the electrical signals, and displays the respective image data.

42. A subject-information imaging apparatus which irradiates a subject to be examined with light,

receives an acoustic wave generated in the subject by the light, converts the wave into an electrical signal, generates image data on the basis of the electrical signal, and displays the image data.